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Citation 2

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CLAIMS

[Claim(s)]

[Claim 1]In a protocol conversion gateway system for connecting mutually via a predetermined means of communication, and employing two or more computer resources in which input and output of data are performed with a different communications protocol, A transform-engine part which transforms communication wording of a telegram based on the 1st communications protocol into communication wording of a telegram based on the 2nd communications protocol according to applied conversion logic, A conversion rule definition part which defines beforehand a protocol conversion rule from said 1st communications protocol to said 2nd communications protocol at least about each of combination of said 1st and 2nd communications protocols more than a general way, A specific protocol conversion rule is chosen from said conversion rule definition part according to directions from a state and the outside of a system, etc., A protocol conversion gateway system having composition which provides a conversion rule selection application part which applies said conversion logic which is equivalent to the protocol conversion rule concerned to said transform-engine part.

[Claim 2]The protocol conversion gateway system according to claim 1 having composition characterized by comprising the following.

A standard translation table in which said conversion rule definition part defines beforehand a

standard protocol conversion rule determined only with combination of said 1st and 2nd communications protocols.

A special converting template which defines beforehand a special protocol conversion rule determined according to concrete disposal of business affairs performed while changing said 1st and 2nd communications protocols.

[Claim 3]Said conversion rule definition part has a translation table for exception handling which defines beforehand a protocol conversion rule supposing an exceptional event which can be defined as neither said standard translation table nor said special converting template, The protocol conversion gateway system according to claim 2 when said conversion rule selection application part occurs [said exceptional event], wherein it applies said conversion logic which is equivalent to a protocol conversion rule in a translation table for exception handling to said transform-engine part.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to a protocol conversion gateway system, and relates to the protocol conversion gateway system for connecting mutually two or more computers or CPUs to which input and output of data are performed with an especially different protocol.

[0002]

[Description of the Prior Art]When connecting mutually and employing two or more devices, such as a computer and CPU, via a means of communication, in order to enable it to access mutually the data which each device has, it is necessary to double the communications protocol between each device beforehand. then, a group which generally constitutes one distributed processing system -- it is mutually connected in many cases on the assumption that a device is accessed mutually and suits with the same communications protocol.

[0003]On the other hand, in order to connect computer and CPU of each other from which the above-mentioned communications protocol differs from the beginning and to apply as a distributed processing system, two kinds of methods can be considered greatly. That is, ** creation is the method of employing, while changing a communications protocol for every communication wording of a telegram carried out with the method of employing, after changing the communications program of

** one device into what performs communications processing with the same protocol as the device of a communications partner beforehand.

[0004]** For the reason of the work which changes the interface between application and a communications program producing a method, or the available communications program necessarily not existing, There was a problem that it was common to be difficult for connecting the existing system currently employed. On the other hand, the program or device only for protocol conversion with which the method of ** is called a gateway, Since the influence which it has on the existing system is suppressed to the minimum from installing between two devices of the different protocol which connects mutually, and making application business possible, this method is often adopted.

[0005]It is necessary to prepare the processing logic of protocol conversion beforehand for the inside of a device, and the contents of such conversion process logic are usually being fixed in the gateway mentioned above in many cases. In order to have enabled it to connect with two or more kinds of communications partners which differ in a communications protocol, a character coding scheme, etc., after preparing the conversion process logic for every communications partner beforehand for the inside of a device, it applies changing the conversion process logic performed according to a actual communications partner.

[0006]As an analogous art of these gateways, the art currently indicated by JP,4-162163,A, JP,4-299758,A, etc. is raised. Although these are the methods of providing conversion process logic beforehand in either the computer which it is going to connect mutually, or CPU, It is supposed that realization of conversion process logic is not described concretely, or some conversion process logic of each protocol engine is included fixed about the protocol made applicable to conversion.

[0007]

[Problem(s) to be Solved by the Invention]In the above-mentioned conventional technology, from it being necessary to make conversion process logic include beforehand for every protocol for conversion. When the kind of protocol for conversion is increased, the processing logic of the whole gateway will increase, and there was a problem that it will be difficult to raise the development efficiency of a gateway including an operation test etc.

[0008]Conversion of the general-purpose communications protocol by a gateway is faced, If it does not wait until the communication wording of a telegram before and behind conversion does not

necessarily correspond to 1 to 1 always, for example, all of some communication wording of a telegram based on the communications protocol before conversion are received, There was a problem that it might also happen that it is not able to do although the creation and transmission of communication wording of a telegram based on the communications protocol after conversion are performed promptly.

[0009]Therefore, the purpose of this invention solves the above-mentioned problem, and the optimal communications protocol conversion process is performed by the gateway which includes only the minimum processing logic, It is in providing the protocol conversion gateway system which can raise the development efficiency of the gateway in connection with the configuration of a distributed processing system.

[0010]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, a protocol conversion gateway system of this invention, In a protocol conversion gateway system for connecting mutually via a predetermined means of communication, and employing two or more computer resources in which input and output of data are performed with a different communications protocol, A transform-engine part which transforms communication wording of a telegram based on the 1st communications protocol into communication wording of a telegram based on the 2nd communications protocol according to applied conversion logic, A conversion rule definition part which defines beforehand a protocol conversion rule from said 1st communications protocol to said 2nd communications protocol at least about each of combination of said 1st and 2nd communications protocols more than a general way, A specific protocol conversion rule is chosen from said conversion rule definition part according to directions from a state and the outside of a system, etc., and it has composition which provides a conversion rule selection application part which applies said conversion logic which is equivalent to the protocol conversion rule concerned to said transform-engine part.

[0011]And a standard translation table in which said conversion rule definition part defines beforehand a standard protocol conversion rule determined only with combination of said 1st and 2nd communications protocols, It has composition which has a special converting template which defines beforehand a special protocol conversion rule determined according to concrete disposal of

business affairs performed while changing said 1st and 2nd communications protocols.

[0012]Said conversion rule definition part has further again a translation table for exception handling which defines beforehand a protocol conversion rule supposing an exceptional event which can be defined as neither said standard translation table nor said special converting template, Said conversion rule selection application part applies said conversion logic which is equivalent to a protocol conversion rule in a translation table for exception handling to said transform-engine part, when said exceptional event occurs.

[0013]In one transform-engine part in which the minimum processing logic was mounted by having had the above-mentioned composition. While load to a resource which each computer resource holds decreases, even when an addition and change of combination of a new communications protocol or disposal of business affairs arise, Since management becomes possible by an addition and change of a standard translation table or a special converting template in a conversion rule definition part, Optimal communications protocol conversion process can be performed by a gateway which includes only the minimum processing logic, and development efficiency of a gateway in connection with a configuration of a distributed processing system can be raised easily.

[0014]

[Embodiment of the Invention]Hereafter, the example of 1 gestalt of operation of the protocol conversion gateway system of this invention is explained in detail using a drawing.

[0015]Drawing 1 is a block diagram showing the composition of the example of 1 gestalt of operation of the protocol conversion gateway system of this invention, As for a conversion rule selection application part and 104, a gateway and 102 are [a communication control part and 107,108] channels a conversion rule definition part and 105,106 a transform-engine part and 103 101.

[0016]In drawing 1, the gateway 101 is formed between the channel 107 of the protocol A and the channel 108 of the protocol B which differ in a kind, and communication based on each protocols A and B is performed via each communication control part 105,106. The conversion rule of the protocol at this time is defined as the conversion rule definition part 104, for example like drawing 4 - drawing 7 as a translation table or a converting template (it is equivalent to the "standard translation table" in a claim, a "special converting template", "the translation table for exception handling", etc.). Then, concrete protocol conversion processing is realized by choosing either of the information defined as

these conversion rule definition parts 104 in a conversion rule selection application part, and applying to the transform-engine part 102. This protocol conversion processing determines output wording of a telegram according to the flow of the protocol of both for conversion, or the combination of the state of the gateway 101, and an input message.

[0017]In conventional technology, after including the protocol conversion processing mentioned above in the gateway as different detailed processing logic for every combination of a protocol, based on the judgment sentence or the incorporated state transition table, concrete protocol conversion was performed respectively. On the other hand, only general-purpose processing logic is prepared and it enables it to realize operation of individual concrete protocol conversion in the embodiment mentioned above, without preparing the processing logic which performs peculiar operation respectively only by giving a conversion rule by the translation table or a converting template.

[0018]The flow chart and drawing 4 in which the flow of protocol conversion processing according [the figure and drawing 3 in which the protocol conversion according / drawing 2 / to the system of drawing 1 is shown notionally] to the system of drawing 1 is shown roughly - 7 are the figures showing the example of a definition of the protocol conversion rule in the system of drawing 1. Hereafter, communication wording of a telegram explains the 1st example of the simplest protocol conversion corresponding to 1 to 1 using drawing 2, drawing 3, and drawing 4.

[0019]When the gateway 201 has an input of the protocol information which shows that the protocols for conversion are "the protocol A (202)" and "the protocol B (203)" (step 301=Yes), After choosing the protocol conversion table (drawing 4) where the information which reads the protocol information concerned (Step 302) and expresses the conversion rule between the protocols A and B was stored (Step 303), The initial state "state I (idle)" is set to the gateway 201 (Step 304).

[0020]If the first communication wording of a telegram ("wording of a telegram A1 (204)") is inputted from the "protocol A" side (Step 305), the general-purpose conversion logic in the gateway 201, The translation table of drawing 4 is applied and the state after the transition according to the combination of the inputted communication wording of a telegram and the present state and the communication wording of a telegram after protocol conversion are determined (Step 306). Since in the case of an initial state communication wording of a telegram is "the wording of a telegram A1

(204)" and the present state is in "the state I (idle)", based on drawing 4, the communication wording of a telegram after "the state S1" and protocol conversion is determined for the state after transition as "the wording of a telegram B1 (205)." Then, while making the present state of the gateway 201 change in "the state S1" (Step 307), Since there is communication wording of a telegram which should be outputted (step 308=Yes), after creating "the wording of a telegram B1 (205)" and outputting to the "protocol B" side (Step 309,310), it returns to Step 305.

[0021]If "wording-of-a-telegram B-2 (206)" is inputted from the "protocol B" side like the above when the gateway 201 is in "the state S1" (Step 305), The translation table of drawing 4 is applied and the communication wording of a telegram after "the state S2" and protocol conversion is determined for the state after transition as "wording-of-a-telegram A3 (207)" (Step 306). And the present state of the gateway 201 is made to change in "the state S2" (Step 307), Since there is communication wording of a telegram which should be outputted (step 308=Yes), after creating "wording-of-a-telegram A3 (207)" and outputting to the "protocol A" side (Step 309,310), it returns to Step 305.

[0022]Next, communication wording of a telegram explains the 2nd example of the protocol conversion corresponding to one-pair ** or many to many using drawing 3 and drawing 5.

[0023]When a gateway has an input of the protocol information which shows that the protocols for conversion are the "protocol C" and the "protocol D" (step 301=Yes), The protocol information concerned is read (Step 302), and after choosing the protocol conversion table (drawing 5) where the information showing the conversion rule between the protocols C and D was stored (Step 303), the initial state "state I (idle)" is set to a gateway (Step 304).

[0024]Then, if "the wording of a telegram C3" is inputted as communication wording of a telegram from the "protocol C" side when a gateway is in "the state S1" (Step 305), While the translation table of drawing 5 is applied and the state after transition is determined as "state S2", the communication wording of a telegram after protocol conversion is determined as "(nothing)" (Step 306). Then, since there is no communication wording of a telegram which should be outputted when the present state of a gateway is made to change in "the state S2" (Step 307) (step 308=No), it returns to Step 305 as it is. Then, if "the wording of a telegram C4" is inputted as communication wording of a telegram from the "protocol C" side (Step 305), the translation table of drawing 5 will be applied and the communication wording of a telegram after "the state I (idle)" and protocol conversion will be

determined for the state after transition as "the wording of a telegram D2" (Step 306). Then, since there is communication wording of a telegram which should make "the state I (idle)" change (Step 307), and should output the present state of a gateway (step 308=Yes), "the wording of a telegram D2" is created, and it outputs to the "protocol D" side (Step 309,310), and returns to Step 305. That is, while a gateway will not change without inputting combining two kinds, the "wording of a telegram C3" and the "wording of a telegram C4", from the "protocol C" side in "the state I (idle)" from "the state S1", "the one wording of a telegram D2" is outputted to the "protocol D" side.

[0025]As mentioned above, after giving only the function to perform general-purpose processing logic to the gateway which performs protocol conversion, . [whether it specifies by various kinds of parameters, defining information, etc. when starting the gateway at the time of a protocol conversion start, and] Or suitable protocol conversion processing is easily realizable by a gateway without processing logic of a fixed conversion rule by choosing and applying the translation table mentioned above according to designating operation, a connection partner, etc. by a user the time of starting of a gateway, and after starting.

[0026]The 3rd example of another protocol conversion is explained using drawing 3, drawing 6, and drawing 7. Like the 1st and 2nd example mentioned above, although this is a case where the protocol conversion between the protocols E and F is performed, Drawing 6 the translation table in which the protocol conversion rule was defined about the combination of all the input messages which can be considered, and states, The converting template by which the protocol conversion rule was defined about the combination of the input message in the disposal of business affairs supposing drawing 7 not using the "wording of a telegram E3" and the "wording of a telegram F3" at all as communication wording of a telegram and the state is shown, respectively. That is, since he does not need to be conscious of the "wording of a telegram E3" and the "wording of a telegram F3", and the "state S3" in connection with these in the case of the above-mentioned disposal of business affairs, it is enough if the contents of the converting template of drawing 7 which is some translation tables of drawing 6 are made into a conversion rule.

[0027]As mentioned above, when it was the usual gateway unit with fixed processing logic, after making all of an input message required for protocol conversion, a state, etc. recognize, By the embodiment mentioned above, to having to make it have to operate according to all conversion

rules. Optimization of protocol conversion processing can be attained by applying the suitable converting template according to each disposal of business affairs, without modifying the processing logic in a gateway at all. By preparing beforehand various kinds of converting templates corresponding to various operational modes or exception-handling mode, while enabling change of the converting template under disposal of business affairs, The change of the operational mode under disposal of business affairs, the transition operation from usual processing to exception handling, etc. become possible. And by doing in this way, each, such as processing of each operational mode, usual processing, and exception handling, can be developed separately, and each processing can be developed efficiently.

[0028]

[Effect of the Invention]As explained in detail above, according to the protocol conversion gateway system of this invention, in one transform-engine part in which the minimum processing logic was mounted. While the load to the resource which each computer resource holds decreases, even when an addition and change of the combination of a new communications protocol or disposal of business affairs arise, Since management becomes possible by the addition and change of a standard translation table or a special converting template in a conversion rule definition part, The optimal communications protocol conversion process is performed by the gateway which includes only the minimum processing logic, and the effect that the development efficiency of the gateway in connection with the configuration of a distributed processing system can be raised easily is acquired.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a block diagram showing the composition of the example of 1 gestalt of operation of the protocol conversion gateway system of this invention.

[Drawing 2]It is a figure showing the protocol conversion by the system of drawing 1 notionally.

[Drawing 3]It is a flow chart which shows roughly the flow of the protocol conversion processing by the system of drawing 1.

[Drawing 4]It is a figure showing the example of a definition of the protocol conversion rule in the system of drawing 1 (the 1).

[Drawing 5]It is a figure showing the example of a definition of the protocol conversion rule in the system of drawing 1 (the 2).

[Drawing 6]It is a figure showing the example of a definition of the protocol conversion rule in the system of drawing 1 (the 3).

[Drawing 7]It is a figure showing the example of a definition of the protocol conversion rule in the system of drawing 1 (the 4).

[Description of Notations]

101 Gateway

102 Transform-engine part

103 Conversion rule selection application part

104 Conversion rule definition part

105,106 Communication control part

107,108 Channel

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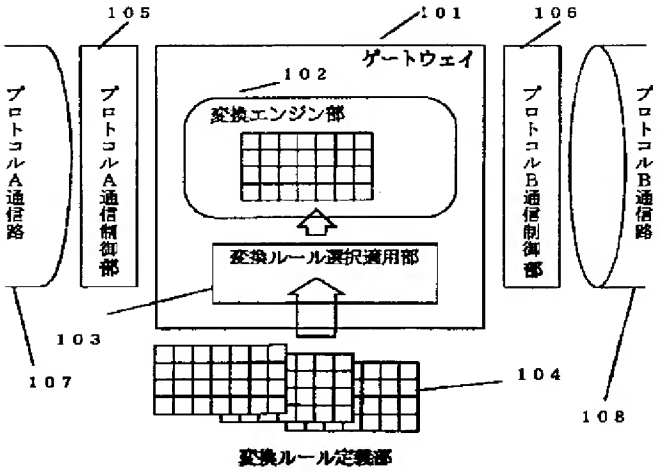
DRAWINGS

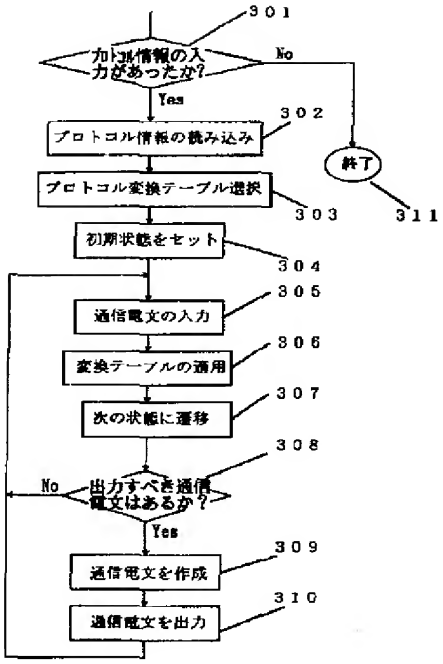
[Drawing 1]

【図1】



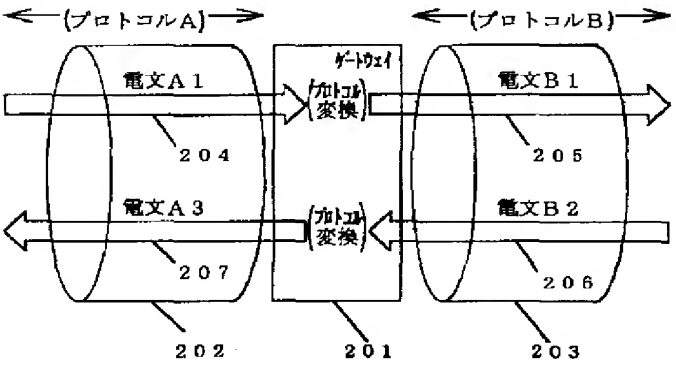
[Drawing 3]

【図３】



[Drawing 2]

【図２】



[Drawing 4]

【図４】

変換テーブルＡ－Ｂ

入力事象＼状態	I (idle)	S１	S２
Ａ１	－>Ｓ１ send　Ｂ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ａ２	－	－>Ｓ２ send　Ｂ３	－>Ｉ（エラー） 回線切断
Ａ３	－	－>Ｉ（エラー） 回線切断	－>Ｉ send　Ｂ２
Ｂ１	－>Ｓ１ send　Ａ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ｂ２	－	－>Ｓ２ send　Ａ３	－>Ｉ（エラー） 回線切断
Ｂ３	－	－>Ｉ（エラー） 回線切断	－>Ｉ send　Ａ２
ｏｔｈｅｒｓ	－	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断

上（矢印の先）：遷移先の状態
下　　：出力事象
－　　：発生しない組み合わせ

[Drawing 5]

【図５】

変換テーブルＣ－Ｄ

入力事象＼状態	I (idle)	S１	S２
Ｃ１	－>Ｓ１ send　Ｄ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ｃ２	－	－>Ｓ１ send　Ｄ３	－>Ｉ（エラー） 回線切断
Ｃ３	－	－>Ｓ２ （なし）	－>Ｉ（エラー） 回線切断
Ｃ４	－	－>Ｉ（エラー） 回線切断	－>Ｉ send　Ｄ２
Ｄ１	－>Ｓ１ send　Ｃ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ｄ２	－	－>Ｉ send　Ｃ３＋Ｃ４	－>Ｉ（エラー） 回線切断
Ｄ３	－	－>Ｓ１ send　Ｃ２	－>Ｓ２ send　Ｃ２
ｏｔｈｅｒｓ	－	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断

上（矢印の先）：遷移先の状態
下　　：出力事象
－　　：発生しない組み合わせ

[Drawing 6]

【図６】

変換テーブルＥ－Ｆ

入力事象＼状態	Ｉ(Idle)	Ｓ１	Ｓ２	Ｓ３
Ｅ１	－>Ｓ１ send　Ｆ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ｅ２	－	－>Ｓ２ send　Ｆ２	－>Ｓ２ send　Ｆ２	－>Ｓ３ send　Ｆ２
Ｅ３	－	－>Ｉ（エラー） 回線切断	－>Ｓ３ send　Ｆ３	－>Ｉ（エラー） 回線切断
Ｅ４	－	－>Ｉ send　Ｆ４	－>Ｉ send　Ｆ４	－>Ｉ send　Ｆ４
Ｆ１	－>Ｓ１ send　Ｅ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ｆ２	－	－>Ｓ２ send　Ｅ２	－>Ｓ２ send　Ｅ２	－>Ｓ３ send　Ｅ３
Ｆ３	－	－>Ｉ（エラー） 回線切断	－>Ｓ３ send　Ｅ３	－>Ｉ（エラー） 回線切断
Ｆ４	－	－>Ｉ send　Ｅ４	－>Ｉ send　Ｅ４	－>Ｉ send　Ｅ４
ｏｔｈｅｒｓ	－	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断

上（矢印の先）：遷移先の状態
下　　：出力事象
－　　：発生しない組み合わせ

[Drawing 7]

【図７】

変換テーブルＥ－Ｆ

入力事象＼状態	Ｉ(Idle)	Ｓ１	Ｓ２
Ｅ１	－>Ｓ１ send　Ｆ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ｅ２	－	－>Ｓ２ send　Ｆ２	－>Ｓ２ send　Ｆ２
Ｅ４	－	－>Ｉ send　Ｆ４	－>Ｉ send　Ｆ４
Ｆ１	－>Ｓ１ send　Ｅ１	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断
Ｆ２	－	－>Ｓ２ send　Ｅ２	－>Ｓ２ send　Ｅ２
Ｆ４	－	－>Ｉ send　Ｅ４	－>Ｉ send　Ｅ４
ｏｔｈｅｒｓ	－	－>Ｉ（エラー） 回線切断	－>Ｉ（エラー） 回線切断

上（矢印の先）：遷移先の状態
下　　：出力事象
－　　：発生しない組み合わせ

[Translation done.]